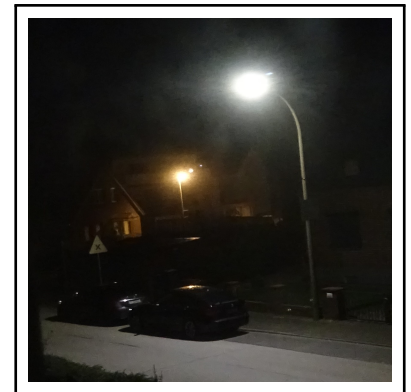


Spectroscopy on Street Lamps

With the help of the Eureca line scan camera e9u-LSMD-TCD1304-STD, it is possible to record sophisticated measurements with high spectral resolution at relatively low cost for school or practical use. We demonstrate here the spectroscopy of street lamps as an application example.

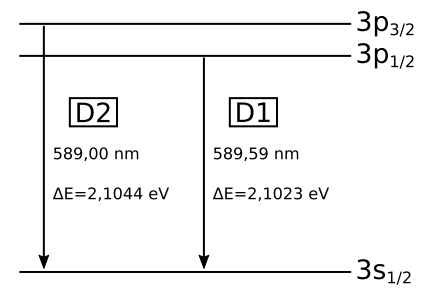
A wide variety of different types of lighting are used for street illumination nowadays, with both gas discharge lamps and LED luminaires being used. With the help of a spectrometer, the different light sources can be conveniently measured and the respective spectra evaluated.



1 Physical Basics

In the past, street lights mostly used high-pressure mercury vapor lamps, but also increasingly fluorescent lamps. Later, sodium vapor lamps (low- and high-pressure lamps), metal halide lamps, and finally LED lights came into use.

As helpful and necessary as street lighting is in the dark, unfortunately there are also numerous disturbing influences on organisms. Therefore, this lighting should be reduced to its absolute minimum, of course also under the aspect of saving energy. In addition, numerous insects, especially moths and beetles, die from the lamps. High-pressure mercury vapor lamps in particular emit light of a wavelength that is especially attractive to insects. Much less attractive is the yellow light of high-pressure sodium vapor lamps.



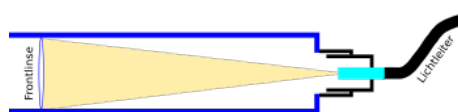
Term scheme Na-D lines

2 Experimental Setup

The measurements shown here were taken with the spectrometer which we had presented in the »Application example Czerny-Turner spectrometer«. You can find details here: <https://www.eureca.de/Appli-en>.

In order to be able to measure the street lights at a greater distance, a finder scope 8 × 50 of a telescope was used. To connect the light guide, a simple adapter was made using 3D printing, which was inserted in place of the eyepiece on the viewfinder telescope. Here, the entrance surface of the light guide was in the focus of the front lens of the telescope. To increase the positioning accuracy, the converted finder scope was also mounted on a tripod. With some practice, street lamps at a distance of up to 50 m could be successfully spectroscoped.

As with all our application examples, detailed instructions and component lists are available on request.



Sketch finder scope



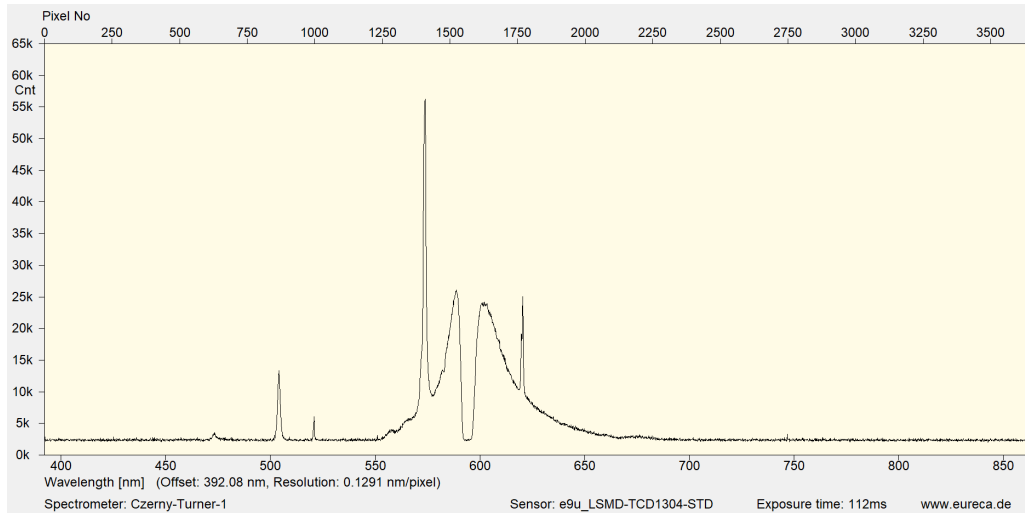
Finderscope with light guide on tripod



3 Recorded spectra

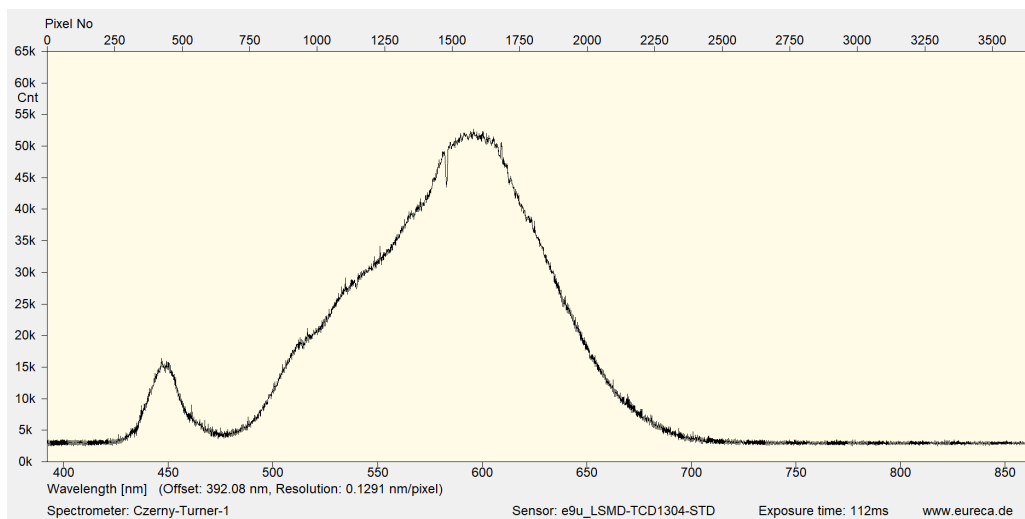
3.1 Na vapor lamp

The sodium vapor lamp belongs to the category of metal vapor lamps. Unlike fluorescent lamps, sodium vapor lamps do not require a fluorescent phosphor. In these lamps, the gas discharge itself already produces visible light and it does not have to be converted into it first. This significantly increases efficiency, especially since the human eye is particularly sensitive in this color range.



3.2 LED Street Lamp

White light-emitting diodes offer a typical color rendering index of Ra 60...80, match or exceed metal halide lamps in terms of luminous efficacy, and outperform sodium vapor and metal halide lamps in terms of service life. They are fully dimmable without loss of efficiency, immediately shine with full luminosity and are therefore increasingly used for street lighting.



More on our website: <https://www.eureca.de/LSC>.

4. August 2023 – Version 1.0

